

Remarks

Applicants note with appreciation the Examiner's acknowledgement of the Applicants' Request for Continued Examination and withdrawal of the prior rejections.

The Applicants have amended numerous of the claims to place them into better form for allowance. Claims 1 has also been amended to recite the step of casting a single piece light metal part by simultaneously applying a casting pressure of more than 50 megapascal from an ejection plunger to a molten metal of a light-metal material poured into a die and an auxiliary pressure applied by a pressurizing pin, arranged in opposed relation to the ejection plunger, to the molten metal filled in the die during solidification of the molten metal under casting pressure to form a casting having pinholes generated in the casting surface. Support for the change may be found in the lower portion of Claim 1 as originally filed and on page 14 of the Specification generally in the top half of the page. Entry of the amendments to the various claims and consideration on the merits is respectfully requested.

Claims 1 - 7, 9, 11 and 13 - 16 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Fujino in view of Sakoda, and in further view of Kaumle.

The problems to be solved in Fujino, namely the issue of shrinkage cavities in thick parts (22) of the plural spoke base parts of the outside rim flange in the aluminum wheel, are quite different from the problems solved by this invention, namely the issue of pinholes in the casting surface.

It has been commonly known that shrinkage cavities are generated in a deep or center region of a casting, as seen in the thickness thereof, at the last stage of solidification of a molten metal due to the solidification shrinkage in volume thereof. To effectively prevent the generation of shrinkage cavities, it is advantageous to reduce the actual volume of a casting to compensate the shrinkage

volume with the insertion of a pressurizing pin, as described in Fujino, rather than relying on “a feeding effect”.

On the other hand, pinholes have been known to be generated in a surface region of a casting, such as within several-hundreds micrometer from the cast surface, at the initial stage of solidification during pressurization just after pouring a molten metal into a die. The pinhole is generally smaller in size than the shrinkage cavity, and the generation mechanism of the pinhole has not yet been fully elucidated. To prevent the generation of pinholes, it is not always effective to insert a pressurizing pin into a molten metal during the solidification.

In this context, this invention adopts the simultaneous application of the casting pressure from the ejection plunger and the additional pressure by the pressurizing pin, which is indispensable for solving the problems of pinholes. Such a simultaneous pressurization is not taught or suggested by Fujino’s casting method, which provides a solution for the issue of shrinkage cavities. Indeed, Fujino’s casting method does not perform simultaneous pressurization, but performs application of pressure of pins (16) to thick parts (22), to which pressure from an ejection plunger (15) is difficult to transfer well. This is disclosed in paragraphs [0003] and [0004] in the machine translation of Fujino. Although Fujino also refers to pressurization by a center pin in the Prior Art section (paragraph [0002]), this is performed to prevent the generation of shrinkage cavities, alternatively of the pressurization from the plunger.

Applicants respectfully submit that the translated version of Fujino also discloses casting the molten metal into a cavity (5), plural pieces of pressurizing pins (16), arranged near the base of the spoke on the circumference, to project the tip parts into the cavity and thus prevent the development of a shrinkage hole in thick parts (22) of the plural spoke base parts of the outside rim flange in the

aluminum wheel. Thus, Fujino teaches insertion of pins into a defined space of a spoke wheel. Nowhere, however, does Fujino disclose that the aluminum or aluminum alloy is injected under an ejection plunger casting pressure. The translated version of Fujino only discloses applying casting pressure through a pressurization pin (16). Therefore, Fujino fails to disclose casting with an injection plunger, which applies pressure into a mold cavity.

As frankly acknowledged by the Examiner, Fujino does not disclose forming a single piece aluminum alloy wheel, wherein a pressure of 50 MPa or more is applied to the molten metal. Further, the Examiner frankly acknowledges that the invention of Sakoda is “directed towards forming a multipart aluminum alloy wheel.” The Office Action further states, however, that Sakoda “never explicitly states that the method could not be utilized to form a single piece wheel.” Applicants respectfully submit that these two statements are in direct contrast with one another.

It is well established that prior art must be evaluated as an entirety, and that all of the prior art must be evaluated as a whole. Panduit Corp. v. Dennison Manufacturing Co., 227 USPQ 337(CAFC 1985); W.L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ at 311(CAFC 1983); and In Re Kuderna, 165 USPQ 575, 578-579 (CCPA 1970). The Court in Panduit Corp stated that “in its consideration of the prior art, however, the District Court **erred** in considering the claims in less than their entireties and **in considering the references in less than their entireties, i.e., in disregarding disclosures in the references that diverge from and teach away from the invention at hand.**” Panduit Corp., 227 USPQ, at 345 [emphasis added]. As a result, the Applicants respectfully submit that the statement that “Sakoda never explicitly states that the method could not be utilized to form a single piece wheel,” fails to take into consideration the entirety of the Sakoda disclosure, which only teaches the production of a multipart aluminum alloy wheel.

In fact, the Applicants respectfully submit that Sakoda teaches away from one-piece alloy wheel casting, as can be seen on page 2, lines 13-20, wherein the limitation of casting a single piece aluminum alloy wheel is discussed. Specifically, Sakoda disclose that while a one-piece wheel has the advantage of high rigidity, reduced number of parts, etc..., these advantages are outweighed by the cost, complication, management of pouring conditions, and the severe structural defects that lead to air leakage in the final product. Thus, the Applicants respectfully submit that when considering Sakoda in its entirety, it clearly teaches away from making a single piece aluminum alloy wheel under high-pressure conditions. One skilled in the art would be led to believe that an increase in casting pressure would add to the inherent structural flaws of a single-piece wheel and further complicate pouring and casting conditions. Thus, Sakoda leads those of ordinary skill in the art to multipart aluminum alloy wheels.

One skilled in the art would also readily recognize that Sakoda uses high pressure casting for two and three piece wheels because utilizing high pressure casting on a one-piece wheel would increase the opportunity for the presence of internal tensions, micro porosities and non-uniformed compactions. Hence, Sakoda discourages constructing a single piece wheel under high-pressure casting conditions. As is well known in the art, high-pressure casting results in a high solidification velocity, which in the construction of a one-piece wheel, can lead to variable fitting throughout the wheel. Applicants respectfully submit that as a result of these limitations, Sakoda utilized high-pressure casting for only “some parts by using casting alloys.” (Sakoda, page 2, line 50). In particular, Sakoda continually discloses that high-pressure casting is used on parts of wheels, rather than an entire single piece wheel.

As was expressly stated by the Court of Appeals in In re Mills, U.S.P.Q. 2d 1430 (Fed. Cir. 1990), “Although a prior art device may be capable of being modified to run the way the patent Applicants’ apparatus is claimed, there must be a suggestion or motivation in the reference to do so.” Applicants respectfully submit that Sakoda and Fujino, simply cannot be combined to defeat the patentability of Applicants’ claimed invention under 35 U.S.C. §103 unless there is positive, concrete evidence in those disclosures teaching or suggesting that a real advantage would be gained to make the suggested combination. In the absence of such an advantage or incentive, the references simply cannot be combined. As always, attempts at hindsight reconstruction are expressly prohibited. Applicants respectfully submit that Sakoda provides no incentive to use high-pressure casting on a single piece wheel. In fact, the Applicants respectfully submit that Sakoda discourages the application of high pressure casting for the construction of a single piece wheel in view of potential defects associated with high solidification velocity.

Turning to consideration of paragraph 22 of the Office Action, Applicants respectfully submit that nothing in Fujino describes the application of simultaneous pressure through an ejection plunger and a pressurizing pin, during the solidification process of the molten metal. (Applicants’ Specification, page 14, line 10-14). Applicants respectfully submit that as a result of this simultaneous pressurization, pinholes can be prevented on the casting surface.

Applicants respectfully submit that Kaumle teaches gloss coating useful in gloss coating vehicle wheels, including a mechanical smoothing step, a coating step, and a metallizing step. However, Kaumle does not teach or suggest the casting process for the article to be coated. Also, Kaumle does not disclose the prior condition of the surface obtained by the smoothing step and thus, it would not be realized from Kaumle that problems exist on the surface, which may be solved by

the Applicants' claimed fabricating method. In view of the foregoing, the Applicants respectfully submit that there is no motivation for a person skilled in the art to combine Kaumle with Sakoda and/or Fujino for the purpose of improving the smoothed or polished surface condition of the cast article. Withdrawal of the Rejection of Claims 1-7, 9, 11 and 13-16 is respectfully requested.

The Applicants also respectfully submit that the numerical limitations in Claims 2 – 4 and 14 have critical significance for commercial success. Specifically, the limitations for the number and/or dimension of pinholes are indispensable for improving the performance of a shiny design surface of a single-piece casting or aluminum wheel. These requirements for pinholes are due to the unexpected results of the invention, and are not taught or suggested by the references, whether taken individually or collectively.

The Applicants also enclose an Information Disclosure Statement, together with the usual PTO-1449 form. Entry into the Official File is respectfully requested.

In view of the foregoing, Applicants respectfully submit that the Application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,



T. Daniel Christenbury
Reg. No. 31,750
Attorney for Applicants

TDC:JEB/pam
(215) 656-3381